

# PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PC0051	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/IB2004/000027	International filing date (day/month/year) 09.01.2004	Priority date (day/month/year) 09.01.2003	
International Patent Classification (IPC) or national classification and IPC H02P7/28, H02P7/622			
Applicant POSITEC GROUP LIMITED et al			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 5 sheets, as follows:</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  06.08.2004		Date of completion of this report  22.04.2005	
Name and mailing address of the international preliminary examining authority:   European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840		Authorized Officer  Foussier, P  Telephone No. +49 30 25901-572	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/IB2004/000027

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-4, 8-11	as originally filed
5-7	received on 10.11.2004 with letter of 08.11.2004

**Claims, Numbers**

1-11	received on 10.11.2004 with letter of 08.11.2004
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**Drawings, Sheets**

1/2-2/2	as originally filed
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- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/B2004/000027

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	2,3
	No: Claims	1,4-11
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

The following documents (D1, D2) are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: DE3607670

D2: GB1519853

### **Added subject-matter**

- 1 - The amendments filed with the International Bureau under Article 19(1) introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT. The amendments concerned are the following:
  - 1.1 - Page 5, l.13-20 : the description of document DE3607670 contains alleged drawbacks which are not described in the document nor in the original description.
  - 1.2 - Page 7, l.4-5 and claim 2: The amendment introduces that the LEDs are connected in parallel so that they provide a constant light emission. In the original description, the corresponding sentence on p.9, l.30-31 states that the capacitor allows to apply a tension to the LEDs so that the light emitted is constant. The technical meaning in the original description is not the same as in the amendments. In the original description, the capacitor is the reason for the constant light emission. Therefore, the amendments introduce added subject-matter.
  - 1.3 - Page 7, l.5-6 : The original description states on p.6, l.25-26 that the power supply with the resistor and the capacitor provides a threshold voltage. The examiner can't find in the original description that the power supply only with the resistor provides a threshold voltage. Therefore the general statement of the amended p.7, l.5-6 which uses the general term "power circuit" adds subject-matter.

### **Inventive Step**

- 2 - The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of claims 1,4-12 does not involve an inventive step in the sense of Article 33(3) PCT.

**2.1 - Document D1 discloses the following features of claim 1 :**

A device for controlling variable speed electric motors comprising an electronic driver unit connectable to the terminals of an electric power source for supplying electric current to at least one electric motor (see col.2, l.34-52) and an optical switch device for triggering said electronic driver unit (see col.2, l.57-64), said optical switch device comprising light emitting means (LED2) and light transducer means (Tp) for detecting and converting light into an electric variable signal, said light transducer means being operatively connected to said electronic driver unit for controlling said at least one electric motor, wherein said light emitter means comprise at least one LED connected in parallel to the electric power line terminals by means of a miniaturised power circuit, characterised in that said at least one LED is a white light, high brightness LED, and in that said miniaturised power circuit comprises one input resistor to preserve said at least one LED, when said electric motor is an DC motor.

In claim 1, the presence of the capacitor depends on the fact that the motor is an AC motor. Therefore, the scope of protection of claim 1 defines also a device comprising only a resistor in the case the motor is a DC motor. Therefore, Claim 1 differs from D1 only in that the light emitting means is a white light LED.

The technical effect of using a white light LED is to increase the light concentration (see application p.4, l.29).

White light LEDs are well known to the skilled person, as well as their physical properties. The fact of using a white light LED instead of an infrared LED (see D1, claim 7) because of the physical properties of the white light LEDs is a normal design procedure for the skilled person that doesn't involve any inventive skills.

Therefore, claim 1 is not inventive.

**2.2 - Claims 4-12 are also either known from D1 (4,5,8,) or not inventive.**

**2.3 - Claims 1,4-12 are also not inventive with respect to D2.**

An example of speed control device using LEDs is disclosed in GB 1519853.

A further disadvantage deriving from this solution is associated with the power supply circuit. In fact, LEDs are operating at low voltage (approx 2V) and therefore  
5 require a power transformer to consistently reduce the mains power (110/230V), and such a transformer cannot be easily housed into a hand-held power tool due to its size limitation. A further method for powering LEDs is that of using a resistor voltage divider, but this solution involves a large heat dissipation, thus resulting in excessive waste of energy. Moreover, the adoption of a plurality of LEDs would  
10 generate a wide light beam that would require the use of a large shield which cannot be conveniently housed into a limited space.

DE 36 07 670 discloses a device for controlling variable speed electric motors having all the features mentioned in the preamble of the new independent claim 1.  
15 However, such prior control device makes use of an optical LED which is connected in parallel to the terminals of an electric power source consisting of a battery or of a rectifier with the interposition of a rather complicated power circuit involving remarkable waste of energy and excessive heat generation. Thus, this known control device cannot be housed in a small sized handle thus preventing  
20 the adoption of miniaturised triggers.

### Summary of the invention

It is a primary object of the present invention to provide a new design of speed  
25 control device that is capable of overcoming the afore mentioned drawbacks of the prior art.

A particular object of the present invention is to provide a speed control device, e.g. for power tools, that is considerably efficient and reliable in use and that  
30 allows a sound improvement of the life and accuracy relative to the power tools and other apparatuses of the prior art.

Another object of the present invention is to provide a speed control device which is capable to reduce the influence of thermal conditions, dust and mechanical vibrations.

- 5 Yet another object of the present invention is that of realising a speed control device, in particular for electric power tools, that makes it possible a substantial reduction of the size of the handle, so that an ergonomic improvement can be achieved.
- 10 These and other objects are achieved by means of a speed control device, in particular for electric power tools in accordance with claim 1.

Thanks to the wide wave spectrum and to the high brightness of the white LED, the light transducer means can be conveniently excited in spite of the reduced size  
15 of the light emitter means. Moreover, the light beam generated by the high brightness LED is relatively narrow and enables to use a small sized shield that can be conveniently housed into the reduced space of a handle or grip member of a power tool.

- 20 Additionally, the present speed control device provides a very high efficiency, insofar as the LEDs can be powered by means of a very small sized power supply circuit adapted to provide a capacitive displacement of phase (for AC motor application) or by means of a small resistor (for DC motor application); both these power supplies can be conveniently housed inside a very small available room.
- 25 Said capacitive phase displacement power supply works as a voltage divider where the values of voltage and current are shifted of 90° each other, so that the power wasted by the capacitor is equal to zero.

Thanks to the reduced size of the miniaturised power circuit for applying an input  
30 tension to the LEDs, the overall device may be incorporated into a hand-held power tool.

Preferably, the light emitter means comprise one pair of white light, high brightness LEDs which are both connected in parallel to the miniaturised power circuit to be alternatively activated by positive and negative semi-waves thereby operating like a voltage divider to provide a constant light emission. the  
5 miniaturised power circuit is adapted to supply the diodes with a threshold voltage.

Optionally, the light may be generated by a pair of miniaturized LEDs specifically designed and realized for SMD (Surface Mounting Device) purpose. The light is  
10 captured by a miniaturized SMD receiver that is centred at the same light spectrum of the emitter, and is adjusted by means of a miniaturized movable shield placed in between said light emitter and light receiver.

The speed control device of the present invention is able to drive control circuits  
15 (thyristor) for AC motors and control circuits (MOSFET) for DC motors.

In addition to the main peculiar aspect of avoiding any movable mechanical contact, the control device according to the present invention achieves the following technical advantages: the device is wear-free, has an extremely long life  
20 (over 100,000 hours) of the light emitter, which exceeds by far the life of the power tool itself, is insensitive to moisture, vibrations and thermal variations. Moreover the device exhibits very low sensitivity to dust—which in the worst case could only decrease the quantity of the light transmitted, a minor inconvenience that does not prejudice the functionality and is easily compensated by a slight increase of the  
25 pressure on the trigger switch

Moreover, the control device according to the present invention achieves the following ergonomic advantages: the interface between the operator and the machine is improved, the shield can be shaped so that it realises a speed  
30 variation curve that is convenient to the operator, for a very accurate a precise operation of the speed control, the size of the trigger switch device is substantially reduced, so that it can be housed inside ergonomically convenient grip handles.



## AMENDED CLAIMS

(96)

1. A device for controlling variable speed electric motors, particularly for hand held power tools and other miniaturised electrically powered apparatuses, comprising an electronic driver unit (5) connectable to the terminals (2, 3) of an electric power source for supplying electric current to at least one electric motor (M) and an optical switch device (7) for triggering said electronic driver unit (5), said optical switch device (7) comprising light emitting means (8) and light transducer means (9) for detecting and converting light into an electric variable signal, said light transducer means (9) being operatively connected to said electronic driver unit (5) for controlling said at least one electric motor (M), wherein that said light emitter means (8) comprise at least one LED (D<sub>1</sub>, D<sub>2</sub>) connected in parallel to the electric power line terminals (2, 3) by means of a miniaturised power circuit, characterised in that said at least one LED (D<sub>1</sub>, D<sub>2</sub>) is a white light, high brightness LED, and in that said miniaturised power circuit comprises one input resistor (R<sub>2</sub>) to preserve said at least one LED (D<sub>1</sub>, D<sub>2</sub>), when said electric motor is an DC motor, and at least one capacitor (C) to provide a capacitive displacement of phase by shifting voltage and current by 90° with respect to each other so that the power wasted by said capacitor (C) is equal to zero, when said electric motor is an AC motor.

2. Device as claimed in claim 1, characterised in that said light emitter means (8) comprise one pair of white light, high brightness LEDs (D<sub>1</sub>, D<sub>2</sub>) which are both connected in parallel to said miniaturised power circuit to be alternatively activated by positive and negative semi-waves thereby operating like a voltage divider to provide a constant light emission.

3. Device as claimed in claim 2, characterised in that said capacitive phase displacement circuit is adapted to supply said LEDs (D<sub>1</sub>, D<sub>2</sub>) with a threshold voltage.

4. Device as claimed in claim 1, characterised in that it further comprises a

main power switch (4) serially connected to one terminal (2) of the electric power source (V).

5        5.        Device as claimed in claim 1, characterised in that said pair of white light, high brightness LEDs ( $D_1$ ,  $D_2$ ) are of the surface mounting device (SMD) type.

6.        Device as claimed in claim 1, characterised in that said light transducer means (9) is a photo resistor.

10       7.        Device as claimed in claim 7, characterised in that said optical switch device further comprises at least one movable shield (10) operatively connected to a manually operable trigger.

15       8.        Device as claimed in claim 8, characterised in that at least one movable shield (10) is interposed between said LEDs ( $D_1$ ,  $D_2$ ) and said photo resistor (9).

9.        Device as claimed in claim 2, characterised in that said electronic driver unit (5) comprises at least one transistor device (11) connected in parallel to a charge switch (12).

20

10.       Device as claimed in claim 10, characterised in that said at least one transistor device (11) is a thyristor (TRIAC).

25       11.       Device as claimed in claim 4, characterised in that said electronic driver unit (5) comprises at least one MOSFET control circuit (11) connected in parallel to a charge switch (12).